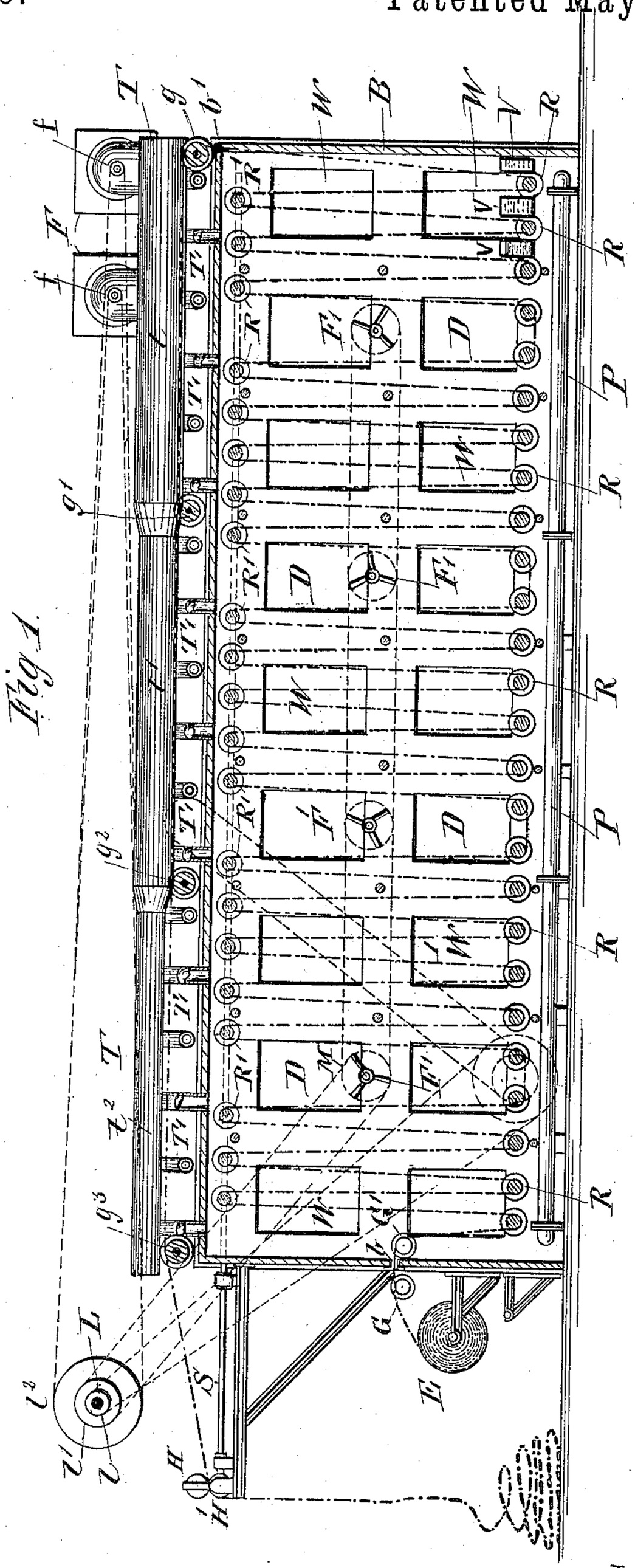
(No Model.)

3 Sheets—Sheet 1.

C. R. PREIBISCH.

APPARATUS FOR DRYING AND OXIDIZING WOVEN FABRICS.

No. 341,769. Patented May 11, 1886.



Witnesses:-
Samuel Edmonds.
W. E. Boulter

Inventor:-
Carl R. Preibisch
per Henry Orth
Atty.

(No Model.) 3 Sheets—Sheet 2.

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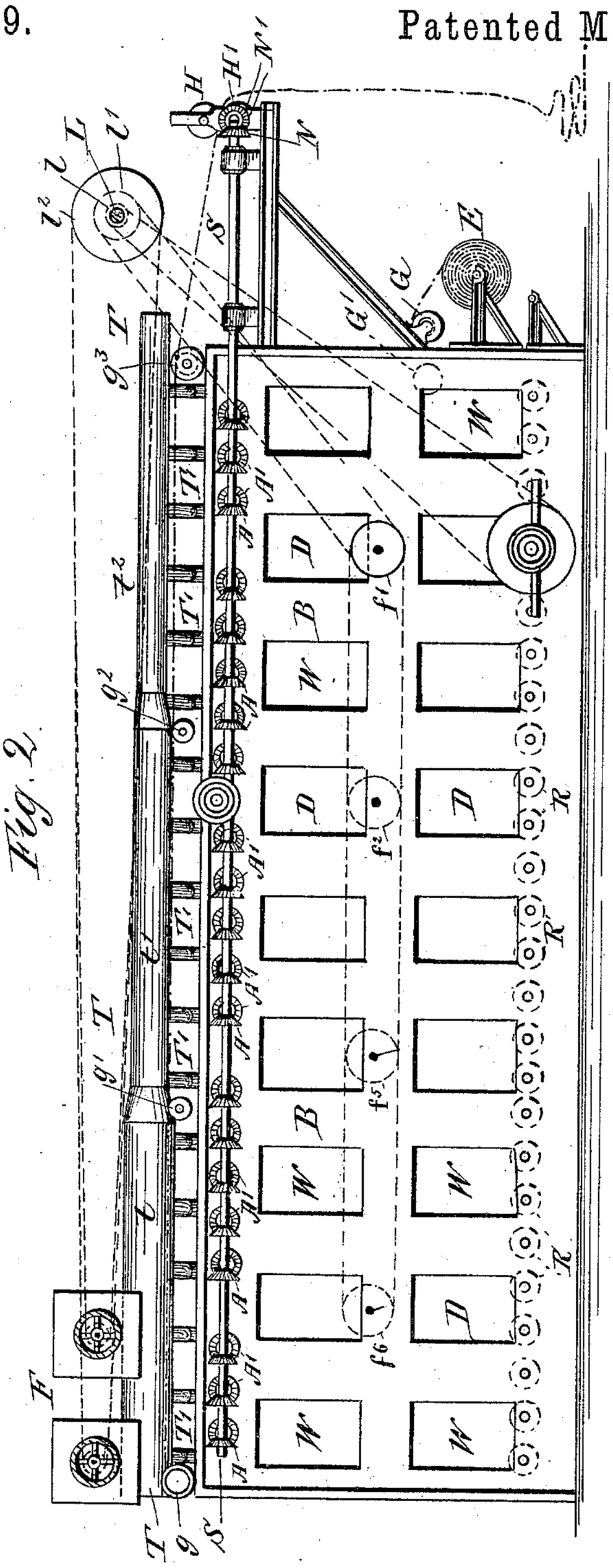

Fig. 2.

Witnesses

W. E. Boulter

Samuel Owen Edmonds

Inventor

Carl R. Preibisch

per Henry Orth

Atty.

(No Model.) 3 Sheets—Sheet 3.

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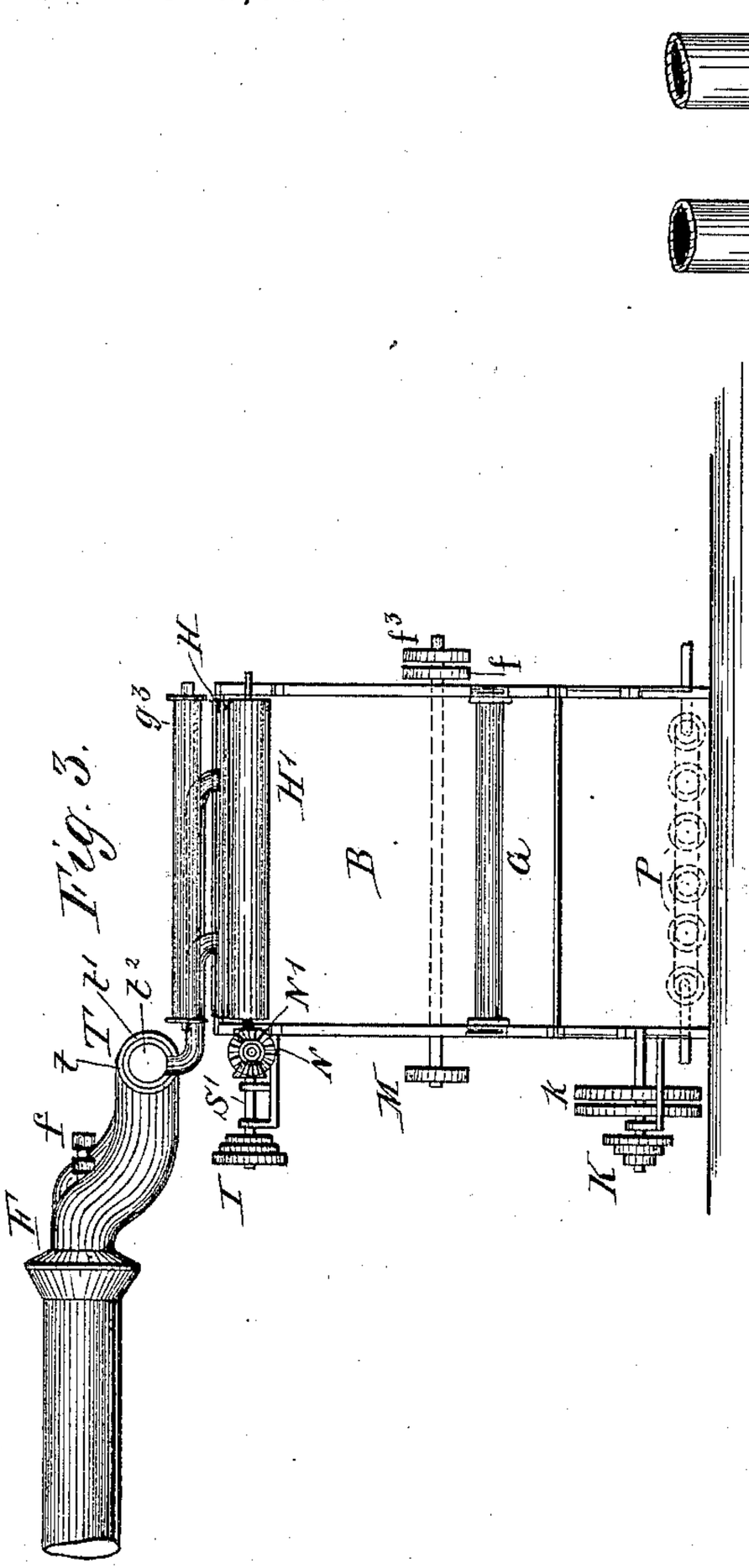

Fig. 3.

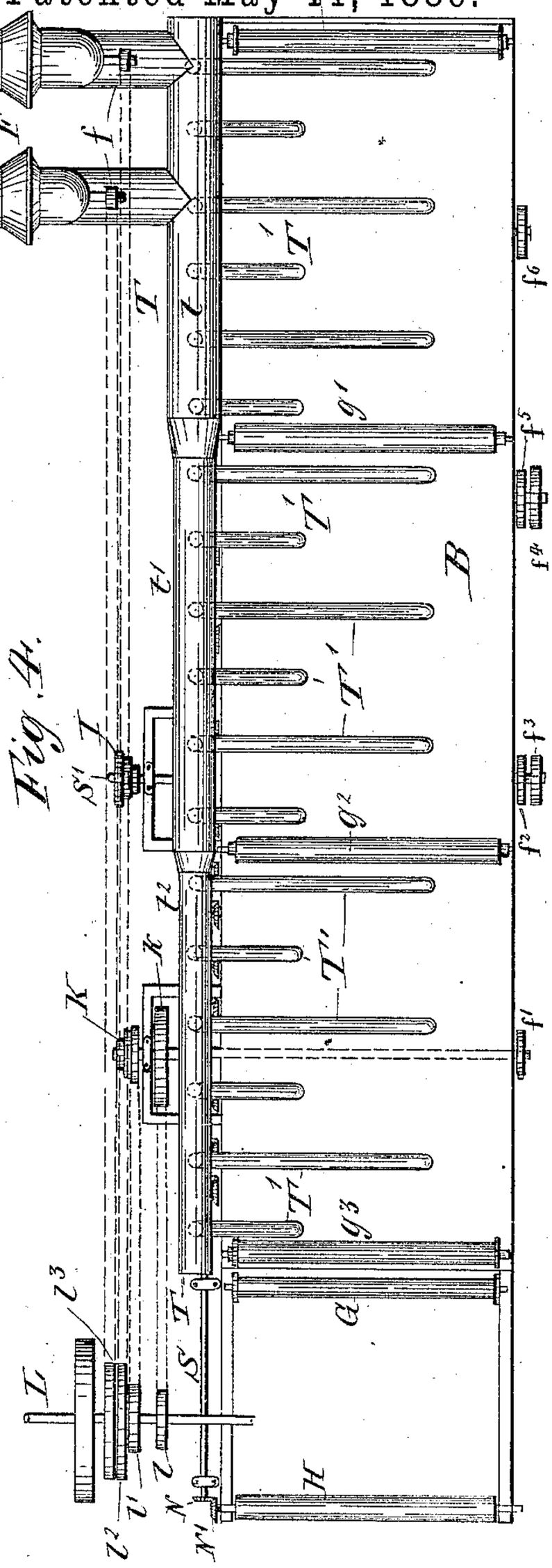

Fig. 4.

Witnesses:-
Samuel Edmonds
W. E. Boulter

Inventor:-
Carl R Preibisch
by Henry Orth his atty

UNITED STATES PATENT OFFICE.

CARL REINHARD PREIBISCH, OF REICHENAU, NEAR ZITTAU, SAXONY, GERMANY.

APPARATUS FOR DRYING AND OXIDIZING WOVEN FABRICS.

SPECIFICATION forming part of Letters Patent No. 341,769, dated May 11, 1886.

Application filed September 25, 1884. Serial No. 143,982. (No model.) Patented in Belgium September 16, 1884, No. 66,319; in France September 16, 1884, No. 164,312; in England September 16, 1884, No. 12,472; in Germany September 17, 1884, No. 32,077, and in Austria-Hungary January 22, 1885, No. 34,799, and No. 2,984.

To all whom it may concern:

Be it known that I, CARL REINHARD PREIBISCH, doctor of philosophy, of the firm of C. A. Preibisch, a subject of the King of Saxony, residing at Reichenau, near Zittau, Saxony, Germany, have invented certain new and useful Improvements in Apparatus for Drying and Oxidizing Woven Fabrics; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

Up to the present time, so far as I am aware, three processes only are known in the art of dyeing in aniline black. In the older method of the three, more especially used in the art of calico-printing, the development of the dye is effected by suspending the fabric in so-called "oxidizing-chambers," the fabric being first passed through a drying-chamber, in which the dye is rapidly dried, the oxidation of the dye being effected and regulated according to the degree of dryness, or, in other words, according to the moisture contained in the fabric, by well-known and specific rules. This process of dyeing by suspension and oxidation is, however, adapted only for the development of patterns, and cannot be employed for dyeing cotton fabrics a solid black or with a black ground, for the reason that at such places where the fabric is not evenly stretched and exposed to the air, stripes of a lighter shade are left, which during the subsequent manipulation of the goods cannot be removed. This inconvenience very soon led to another method of treatment, which consists, essentially, in oxidizing the dye or developing the black by means of steam in a closed chamber without subjecting the fabric to a drying process. The black so obtained can, however, not be compared in purity and beauty of color with that resulting from atmospheric oxidation.

The third method now generally resorted to in the dyeing of cotton yarns in hanks or warps is based upon the action of a metallic salt—usually chromate of potash—as an oxidizing agent. This method, however, is not applicable to the dyeing of fabrics on the ground that, regardless of the fact that it is very difficult to obtain a uniformly-dyed material, the color is not fast—that is to say, it decolorates.

It is a well-recognized fact that aniline black as a fast color surpasses all other black coloring-matter in use, and in view of this the dyeing of fabrics by the older methods has lately again come into use.

Besides the above-described defect of a striped material, the process referred to has yet two very material inconveniences—namely, in that the operation of oxidation becomes a very difficult one, owing to the chloric-acid gas generated, which is highly detrimental to health, and in that the fabric itself is deteriorated when it is allowed to remain in the presence of the gas for any length of time.

The object of this invention is to provide means whereby the above-described disadvantages may be avoided; and the invention consists in a novel construction of apparatus, substantially as hereinafter fully described, and specifically pointed out in the claim.

In practice the drying and oxidizing process takes place in a suitable chamber, through which the fabric is caused to travel in a vertical zigzag or tortuous path at a slow but uniform rate of speed and at a uniform tension, in a temperature of about 44° to 50° centigrade, air at a temperature of about 25° centigrade being continuously admitted and the moisture-laden air and the gases generated continuously drawn off by one or more exhaust-fans. The arrangement of air-admission air-heating, and exhaust devices is such that the entire length of fabric is surrounded by heated-air currents drawn off with the gases from between the intervals in the line of travel of said fabric. After the latter has been dried and the dye oxidized it passes to one end of the chamber, which is closed at bottom and, if desired, may be a separate chamber in which there is little or no air-circulation, the atmosphere therein being kept moist by means of reservoirs containing water, which is of great importance to the development of a good color. After the fabric

has left the second or moistening portion of the apparatus it passes out at top and over the length of the apparatus, and is again dried and then deposited in front of said apparatus.

In the accompanying drawings, Figure 1 is a longitudinal section, Fig. 2 a side elevation, Fig. 3 an end elevation, and Fig. 4 a top plan view, of my improved apparatus.

The apparatus is composed, preferably, of a suitable metallic frame supporting a wooden box, B, that has upon its sides a series of windows, W, and doors D, alternating with one another, by means of which the process of drying may at all times be watched and the degree of heat within the apparatus ascertained and regulated accordingly, if necessary. Along the bottom of the box are arranged in circuit a series of heating-pipes, P, supplied with steam from any suitable generator. Immediately above the heating-pipes are arranged a series of rolls, R, loosely mounted in suitable bearings formed in the sides of the box B. As shown, the latter is open at bottom except at its rear end, where said bottom is closed by reservoirs or vessels V, extending from side to side, and the loose rolls R, to avoid any direct upward currents of air, the water being heated by the pipes P to such a degree as to produce by evaporation a moist atmosphere at that end of the box.

Immediately below the closed upper end of the box are arranged a second series of rolls, R′, that have their bearings in the sides of the frame on vertical lines intersecting the centers of the spaces intervening between the lower rolls, R—that is to say, the upper series of rolls, R′, lie between the lower series of rolls, R. The journals at one end of the rolls R′ project through the side of the box B and carry bevel-pinions A′, of uniform diameter, that mesh with corresponding pinions, A, secured to a shaft, S, from which the upper rolls are driven at a uniform slow rate of speed.

At the front end the apparatus has suitable bearings for the reception of the roll E, upon which the fabric is wound, the front wall having a slot or narrow opening, *b*, for the passage of the fabric. In front and rear of said opening *b* are mounted guide-rolls G G′, respectively, that guide the fabric to the first lower idle-roll R. From the latter roll the fabric is passed upward to the first operating-roll R′, thence to the second idle-roll R, and again upward to the second operating-roll R′, and so on alternately from idle-roll to operating-roll to the end of the box, the fabric passing from the last idle-roll R up through a narrow opening or slot, *b′*, in the roof of the box. At the point where the fabric passes out of the box is mounted a guide-roll, *g*, over which the fabric passes, thence over guide-rolls g' g^2 g^3 to and between the drawing-rolls H H′, from which it is delivered onto the floor, the path traveled over by the fabric being indicated by peculiar dotted lines.

On the top of the box and along one side thereof is arranged a pipe or trunk, T, that is preferably made of three or more sections of different diameters, the section *t* having the greatest diameter, being connected with one or more exhaust-fans, F, and extending over the rear third of the length of the box B, the section *t′*, the diameter of which is greater than that of section t^2 and less than that of section *t*, extending over the intermediate third of the length of the box.

The object of making the exhaust-pipe in sections of varying diameter from rear to front is to provide means whereby the gases generated during the process of oxidation of the dye may be exhausted as fast as they are generated, and it is obvious that the development of these gases will increase in proportion to the length of time the fabric is exposed to the oxidizing atmosphere and consequently to the degree of desiccation, the volume of such gases increasing proportionately from the front to the rear of the apparatus.

In order to produce within the box a uniform and perfect circulation of the air admitted at the bottom thereof, and a uniform exhaust of the moisture-laden air and gases from the top, I employ a number of ventilating-fans, F′, arranged along and within the box on a line midway or about midway between its top and bottom, the fan-blades extending preferably from side to side of the box in the spaces intervening between the folds or lengths of the traveling fabric, and by connecting the said intervening spaces with the exhaust pipe or trunk T by means of branch pipes or trunks T′, opening alternately on opposite sides of and into the box B, as more plainly shown in Fig. 4. This is necessary for the reason that the fabric itself will subdivide the box into as many practically closed chambers as there are pairs of rolls R R′, each two adjacent folds or lengths of fabric forming the end walls of such chambers, the box itself forming the top and side walls thereof. It will be observed that by means of this arrrangement of air admission, distributing, and exhaust the entire length of fabric is subjected uniformly to the action of the heated air, and the said air, charged with the moisture, together with the gases generated under the influence of heat, are uniformly exhausted. As the fabric is in continuous motion, the oxidation of dye also takes place uniformly over the entire fabric, thereby avoiding the formation of stripes of lighter shade, due to imperfect oxidation when the fabric is suspended within the oxidizing-chamber, as above set forth.

As before stated, the fabric before passing out of the apparatus passes through a space that is closed at bottom by reservoirs or vessels V, containing water, which vessels are located above or between the heating-pipes that heat and evaporate the water to produce a moist atmosphere by which the fabric is moistened. The space in which the goods are moistened may, if desired, be closed on all sides, and the fabric fed through an opening in its front wall; but this is deemed unneces-

sary since the lengths of fabric or goods themselves form such a wall.

In practice the apparatus is of sufficient width so that the rolls R R′ will accommodate two widths of goods.

The operating device may be driven in any suitable manner from a prime motor, and the means shown in the drawings and hereinafter described are given as one convenient mode of driving said parts. The shaft S is driven from a counter-shaft, S′, that carries a stepped belt-pulley, I, whereby the rolls R′ may be speeded according to the nature and grade of the goods treated, as mixed goods, for instance, will require a longer exposure to the oxidizing and moistening atmosphere than plain cotton goods. The pulley I on the counter-shaft S′ is belted to a like pulley, K, on a shaft near the forward end and bottom of the machine, which shaft also carries a belt-pulley, *k*, belted with a pulley, *l*, on the main driving-shaft L. The shaft of the first ventilating-fan, F′, carries on one end a belt-pulley, M, belted to a pulley, *l′*, on the main driving-shaft L. At its opposite end it carries a belt-pulley, *f′*, belted with a like pulley, f^2, on the shaft of the second ventilating-fan or that in rear of the first, which shaft carries a second pulley, f^3, belted to a like pulley, f^4, on the shaft of the third ventilating-fan, that also carries a second belt-pulley, f^5, that is belted with a like pulley, f^6, on the shaft of the last ventilating-fan, F′, at the rear end of the apparatus. The drawing-rolls H and H′ are driven by a bevel-pinion, N′, on the journal of one of the rolls, and a bevel-pinion, N, at the end of shaft S, as shown, said bevel-pinions being of the same diameter as the pinions A on said shaft S and the pinions A′ of the rolls R′. The exhaust-fans F are driven from belt-pulleys l^2 l^3 on the main driving shaft L, belted to pulleys *f* on the fan-shafts.

I have stated above that the temperature of the air admitted to the apparatus at the bottom thereof should be of about 25° centigrade, and inasmuch as the air in the work-room in which the apparatus is located is generally of about that temperature, a preliminary heating thereof is not necessary, and such air is then rapidly brought to 44° or 50° centigrade on its passage over the heating-pipes P and by the heat radiated from the said pipes. The process of drying and oxidation proceeds therefore very rapidly. When the fabric or goods has passed over about two-thirds of the apparatus, it is thoroughly dry and the dye completely oxidized and commences to show black.

Experience has demonstrated that, in order to obtain a good color, the full development thereof should take place in a moist atmosphere, and this is fully effected by the arrangement of water-tanks hereinabove described.

By means of the described apparatus I am not only enabled to dye cotton goods in black aniline, but also mixed goods, or goods made of half cotton and half wool, which could not be done by any of the old methods or processes above referred to, the wool assuming a dead or dirty color and losing the property of being dyed afterward, which is not the case when such goods are treated in the described apparatus, as said goods afterward, by treatment in logwood-dyes, may receive any desired shade of black. These goods distinguish themselves not only by their true or good color, but also by their softness and pliability to the touch. Finally, I may state that silk goods have been treated as described with excellent results.

Having thus described my said invention, what I claim is—

The combination, with an inclosing box or casing provided at the lower edge of a portion of its lateral walls with air-ports and means for heating the air admitted, of a lower set of loose rolls and upper set of propelling-rolls, the latter lying in the vertical plane that intersects the space between the lower rolls, gearing for imparting to said upper rolls a uniform rotation, ducts for exhausting the gases from the casing, and water-reservoirs arranged at the closed end of said casing, substantially as and for the purpose specified.

In testimony whereof I affix my signature in presence of two witnesses.

CARL REINHARD PREIBISCH.

Witnesses:
A. DEMELIUS,
B. ROI.